Network Vault Applications

Qualitrol Distribution Monitoring

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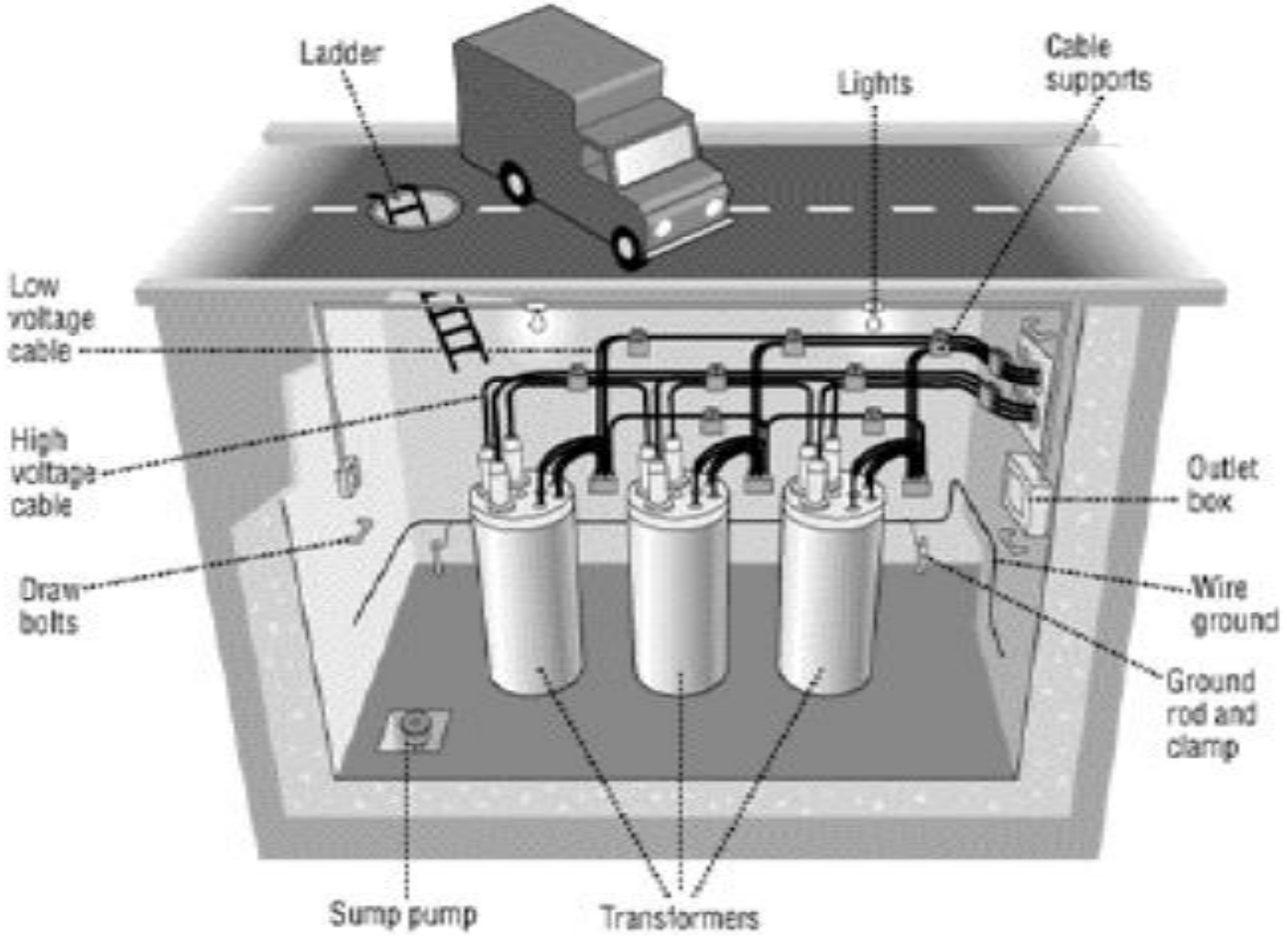
Defining Reliability

Basic Underground Vault



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What's Underground?

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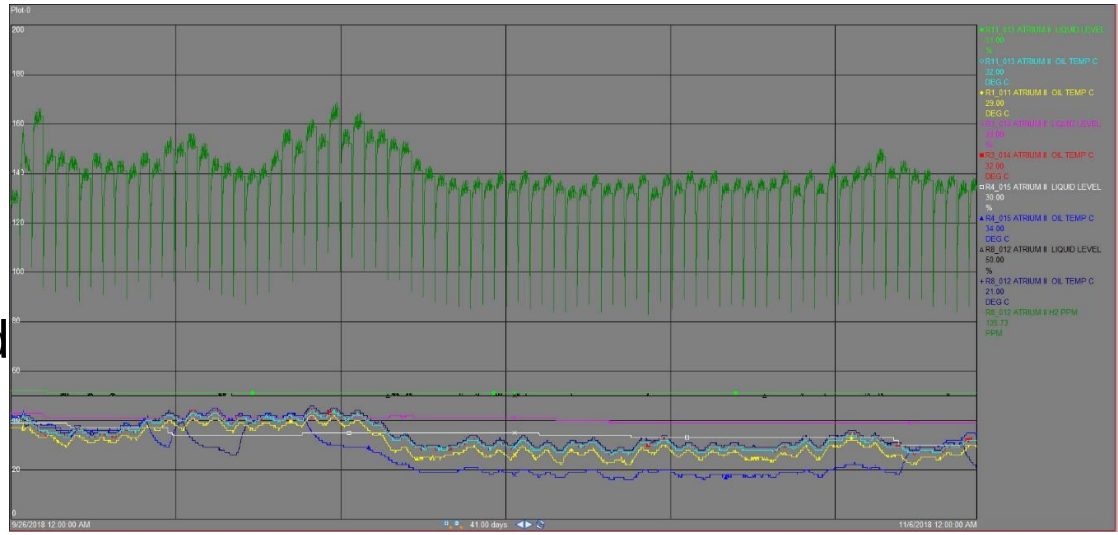
Why Monitor?! ….

- There is a compelling need to:
  - Increase safety to both public and utility personnel
  - Reduce scheduled maintenance with actual *predictive* failures=CBM
  - Minimize potential costs/maximize asset ROI
  - Increase “monitoring” = ability to trend for protection
  - Communities don’t tolerate safety issues nor tolerate service disruptions / Media & political pressure
  - Common comments- “If a transformer fails, I hope it fails ***quietly***”

Typical Vault monitoring parameters

- Oil Level
  - *Normally we can Retrofit what is already on the transformer*
- Oil Temperature
  - *Normally we can Retrofit what is already on the transformer*
- Sump Pump
- Level in Vault
  - One or two (ex. 24’ from bottom and 6’ below electronics)
- Ambient temperature
- Hydrogen

- Monitor Transformer Oil Conditions in Real-Time
  I. Pressure
  II. Level
  III. Temperature
  IV. Hydrogen
- Trend Data for Analysis
  I. Behavior when overloaded
  II. Oil Leaks
  III. Transformer Life Expectancy
  IV. Signs of Imminent Failure



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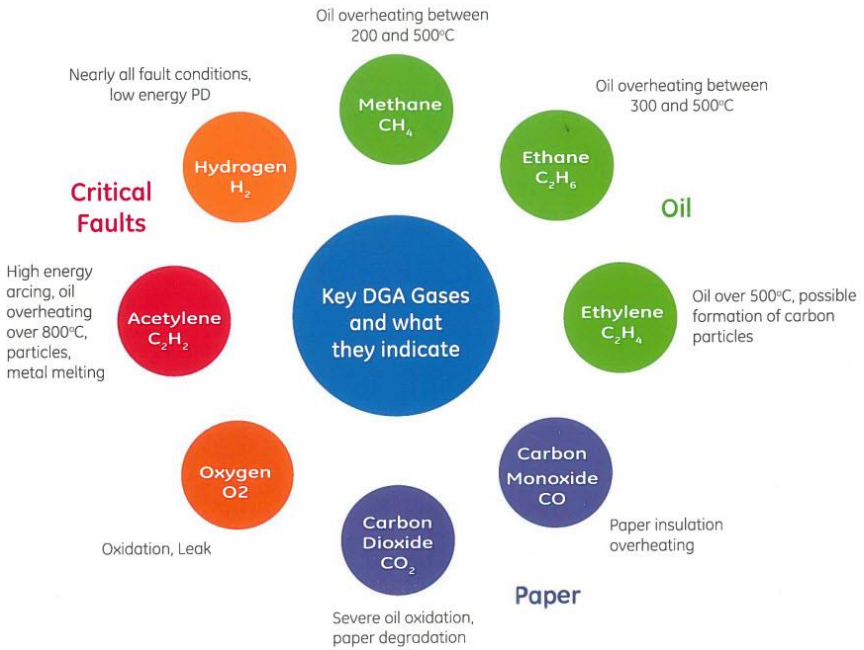
Online Hydrogen DGA Monitoring

- Why Hydrogen?
  I. Produced in most types of faults
  II. Elevated Hydrogen levels provide indication of fault conditions
  III. Multi-gas sensors are expensive and aren't designed for vault applications
- Hydrogen DGA Sensor
  I. Sensor one sample every 2 minutes

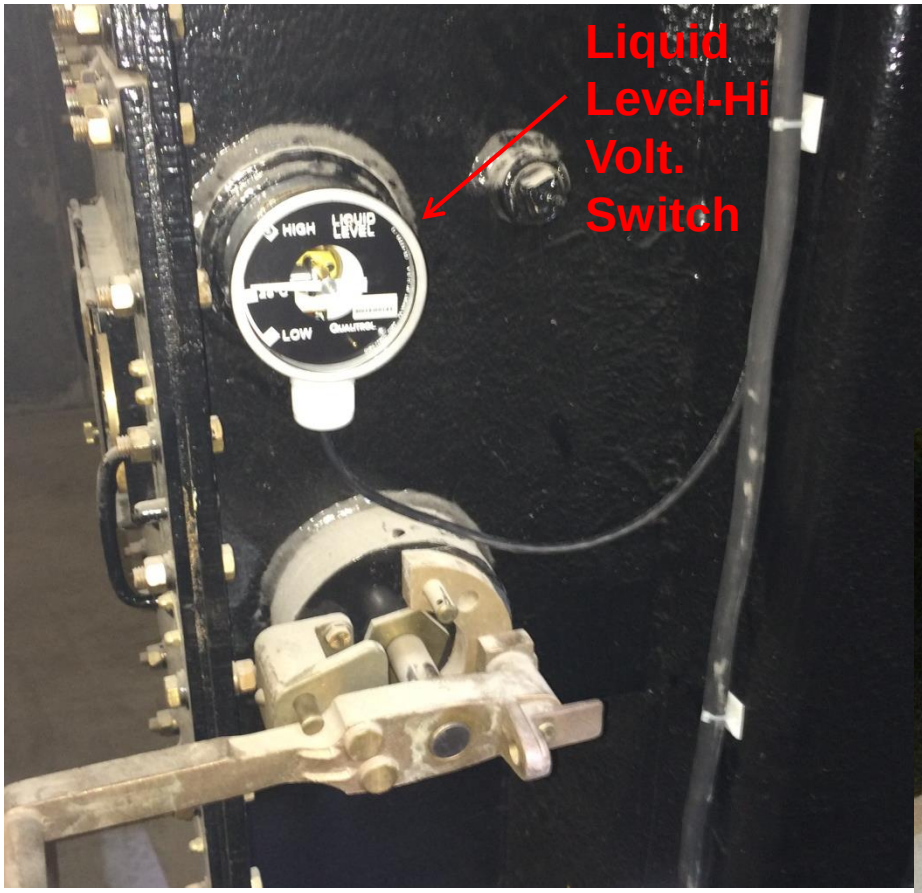


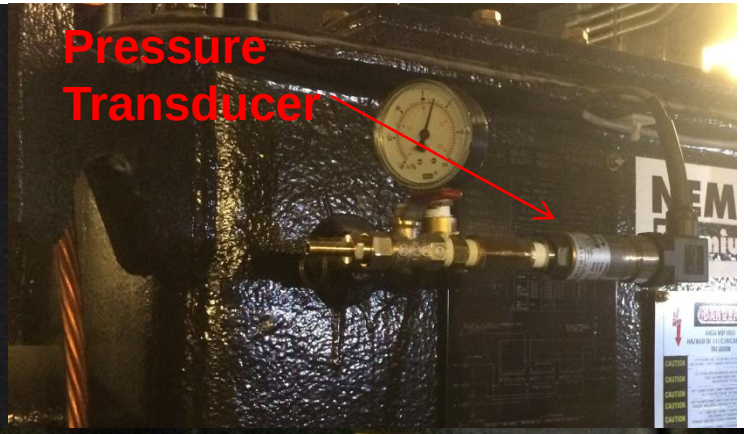
IN A NUTSHELL

Relative quantities of dissolved fault gases generated by incipient faults

Dissolved fault gases	Corona	Overheating		Arcing
		Insulation	Oil	
Hydrogen (H2)	High	Low	Low	High
Carbon monoxide (CO)		High		
Methane (CH4)	Low	Traces	Medium	Low
Ethane (C2H6)	Traces		Medium	Low
Ethylene (C2H4)			High	Low
Acetylene (C2H2)			Low	Medium

Hydrogen is the accepted indicative key fault gas that evolves in most types of faults.





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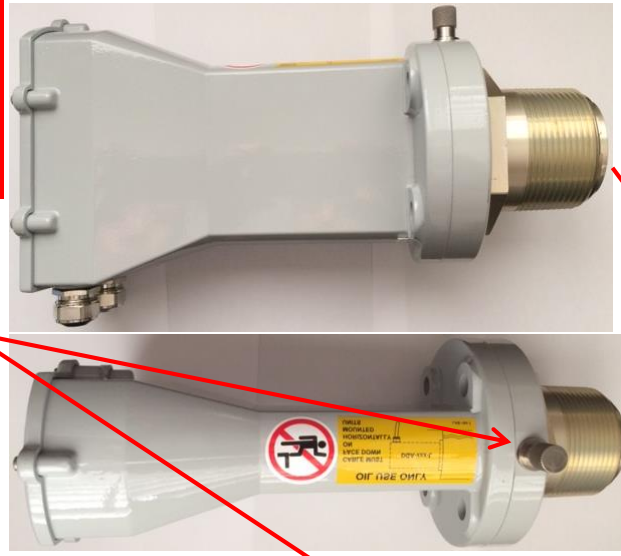
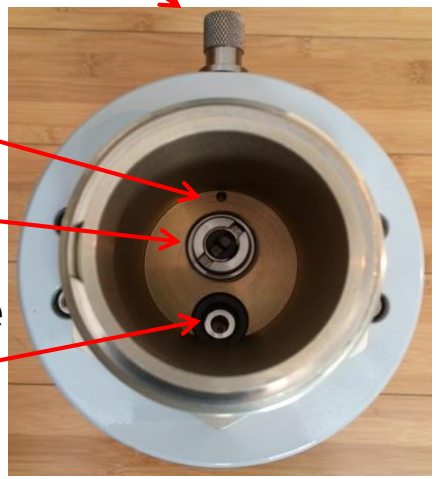
DGA 250 H2 with custom Pressure Sensor- Submersible

- Sterile Oil Sample for Lab
- Comms Conn´s.



- Lab sample orifice
- H2 Sensor
- Pressure Sensor



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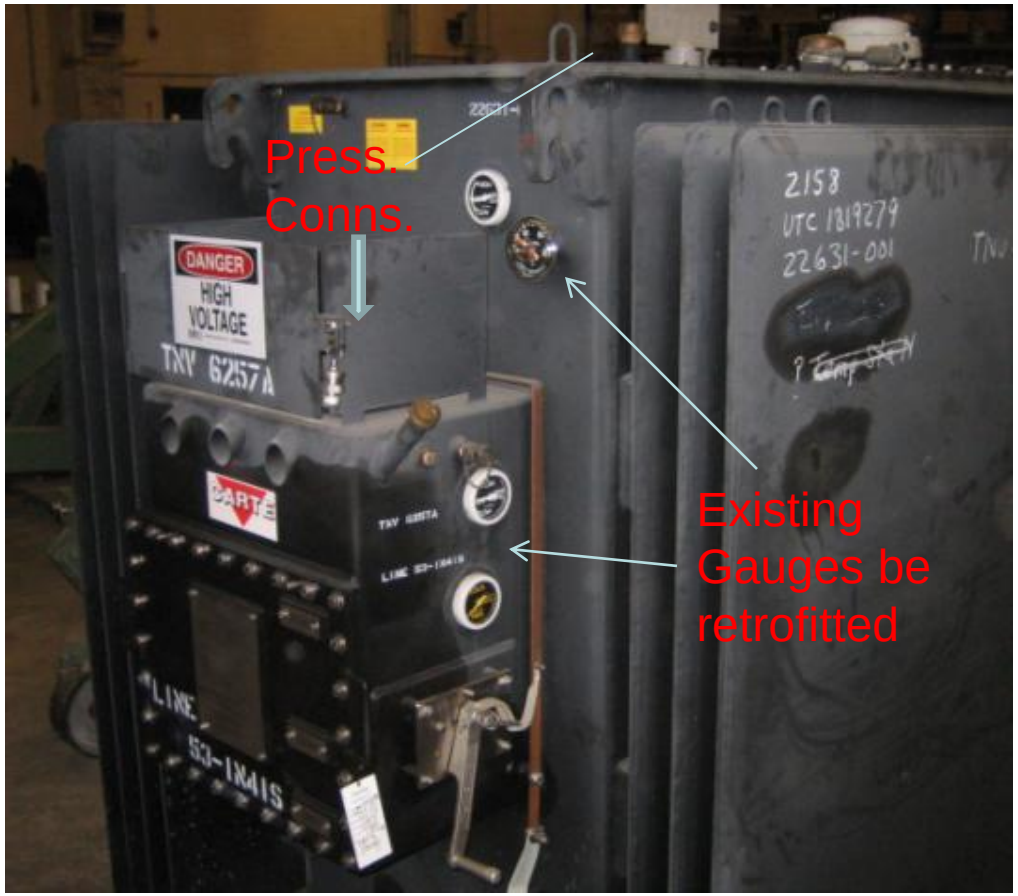
Example of gauge retrofit



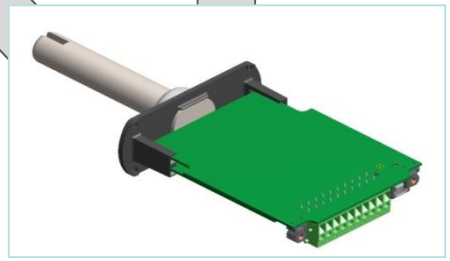
Single Gas DGA Offering

DGA 250

RPRR – 2.5” NPT Union Fitting
Thread mount

DGA 150

Drain Valve – 1.5” NPT Union Fitting
Thread mount



Hydrogen DGA Sensor

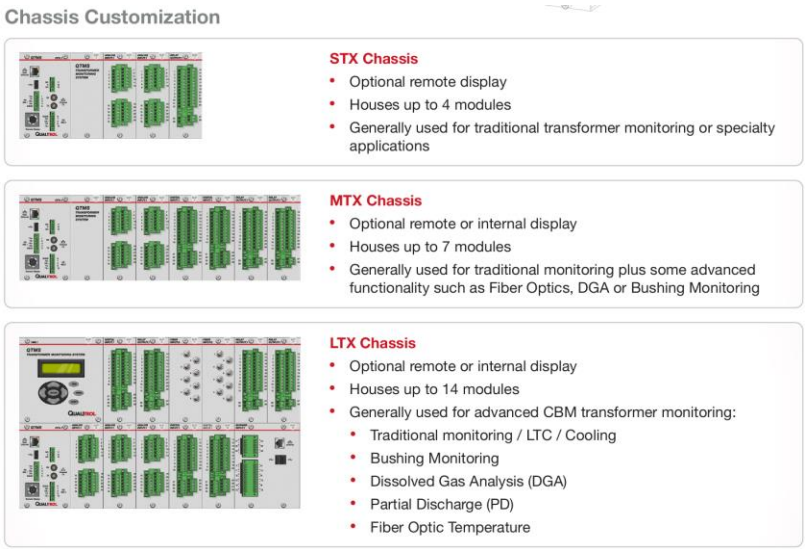
Gas or Oil Configurations

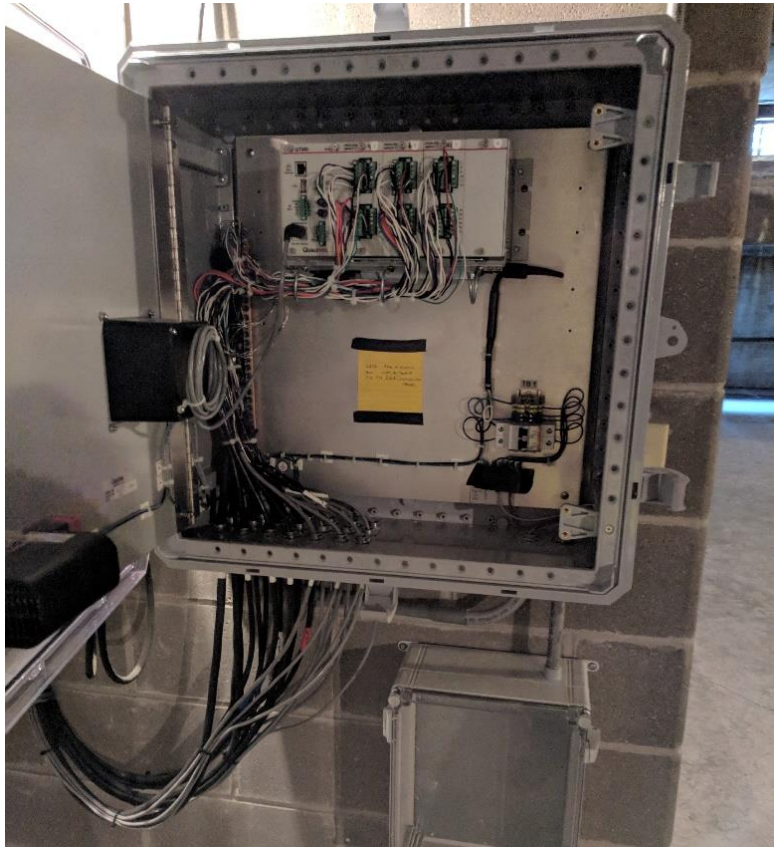
Communication with 509 ITM

Installation example

Modular approach

- The new approach has a standard card per transformer
- They have different QTMS chassis depending on the potential of transformer in the vault.
- They can add card later






Thank you